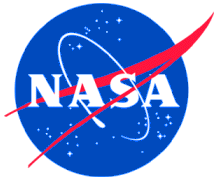


GSFC Space Science Mission Operations (SSMO) and Space Weather

Rick Harman

Space Science Mission Operations



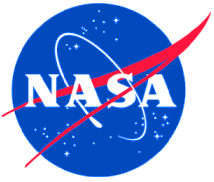
SSMO Spacecraft



Mission	Launch Year	MOC Location	Mission Director	Science Type	# s/c	Orbit Regime	Catalog #
ACE	1997	GSFC	R. Sodano	Heliophysics	1	L1	N/A
AIM	2007	LASP	O. Cuevas	Heliophysics	1	LEO	31304
ARTEMIS*	2007	UC Berkeley	G. Marr	Heliophysics	2	P1, lunar orbit; P2, Lunar Lagrange Point 1	30581, 30582
Fermi	2008	GSFC	B. Pumphrey	Astrophysics	1	LEO	33053
IBEX	2008	Orbital	O. Cuevas	Heliophysics	1	HEO (T = 9 days)	33401
IRIS	2013	ARC	D. Knapp	Heliophysics	1	LEO	
LRO	2009	GSFC	S. Odendahl	Planetary (Lunar)	1	Lunar Orbit	N/A
Van Allen (RBSP)	2012	APL	D. Quinn	Geospace / Heliophysics	2	HEO	38752, 38753
RHESSI	2002	UC Berkeley	G. Marr	Heliophysics	1	LEO	27370
SDO	2010	GSFC	D. Fink	Heliophysics	1	GEO	36395
SOHO***	1995	GSFC	D. Quinn	Heliophysics	1	L1	n/a
STEREO	2006	APL	D. Quinn	Heliophysics	2	Heliocentric	n/a
Swift	2004	Penn State	B. Pumphrey	Astrophysics	1	LEO	28485
THEMIS	2007	UC Berkeley	G. Marr	Heliophysics	3	HEO	305880, 30584, 30585
TIMED	2001	APL	D. Quinn	Heliophysics	1	LEO	26998
WIND	1994	GSFC	O. Cuevas	Heliophysics	1	L1	n/a

* ARTEMIS is a bifurcation of the THEMIS extended mission.

*** SOHO is a cooperative program between ESA and NASA.



SSMO Spacecraft

LRO,
ARTEMIS



GEO: SDO

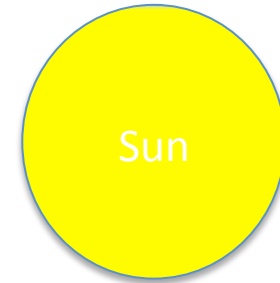


LEO: AIM,
Fermi, IRIS,
RHESSI,
Swift,
TIMED

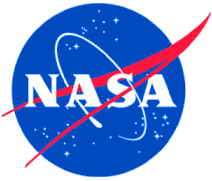
HEO:
THEMIS,
IBEX, Van
Allen

L1: ACE,
SOHO, WIND

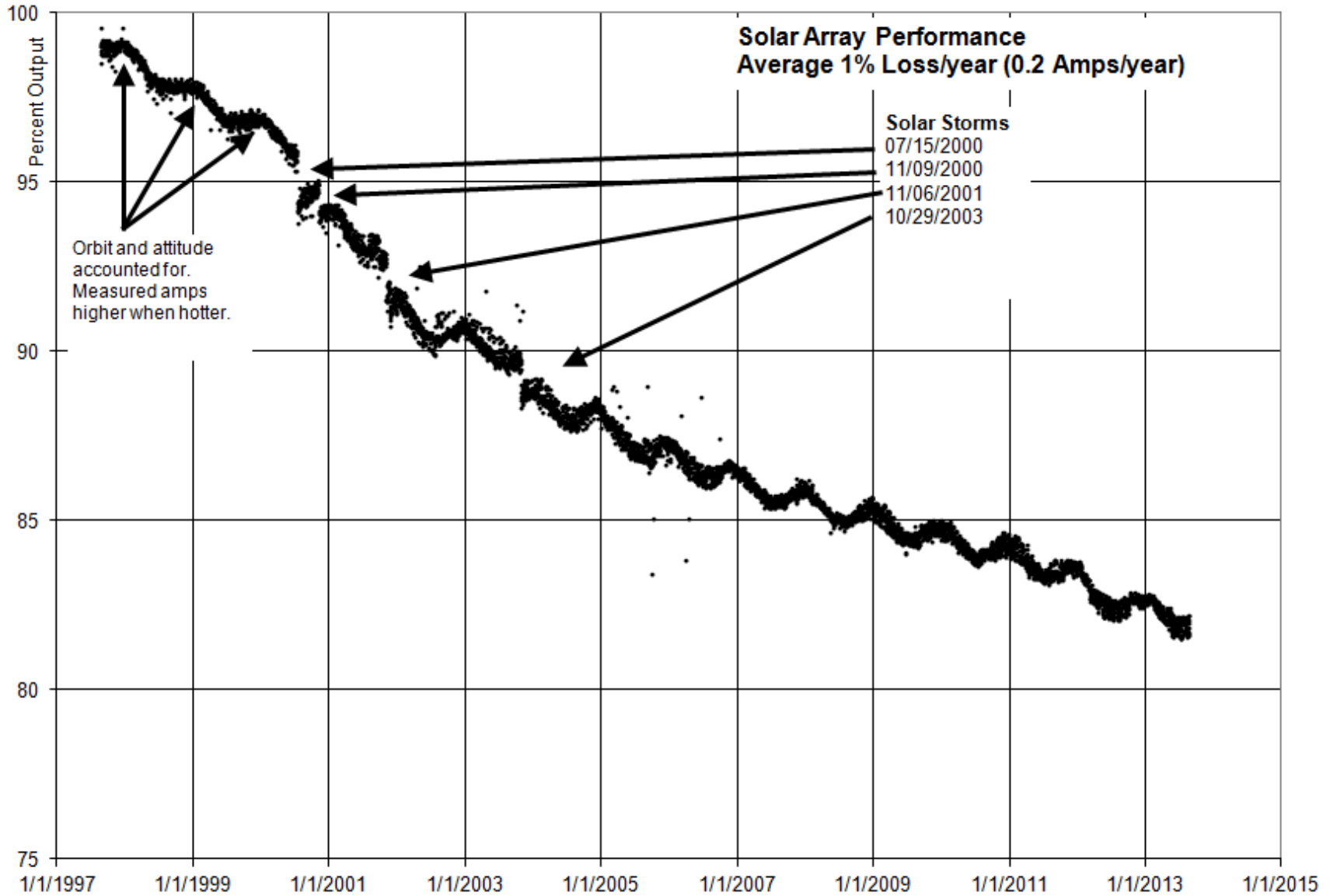
*Stereo
Behind*

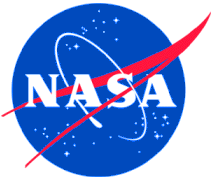


*Stereo
Ahead*

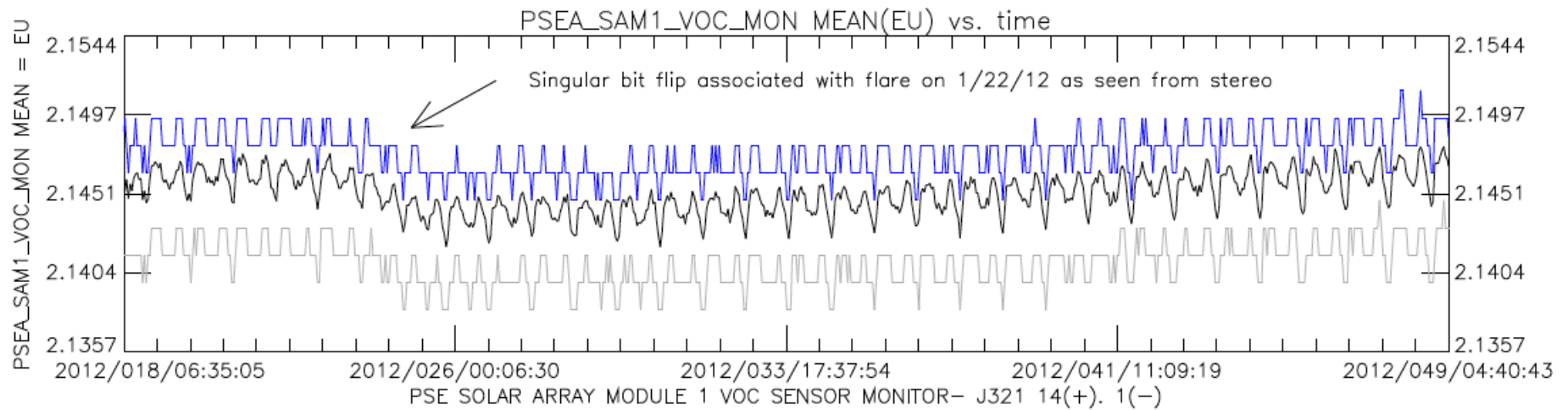


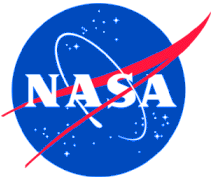
ACE Solar Panel Degradation





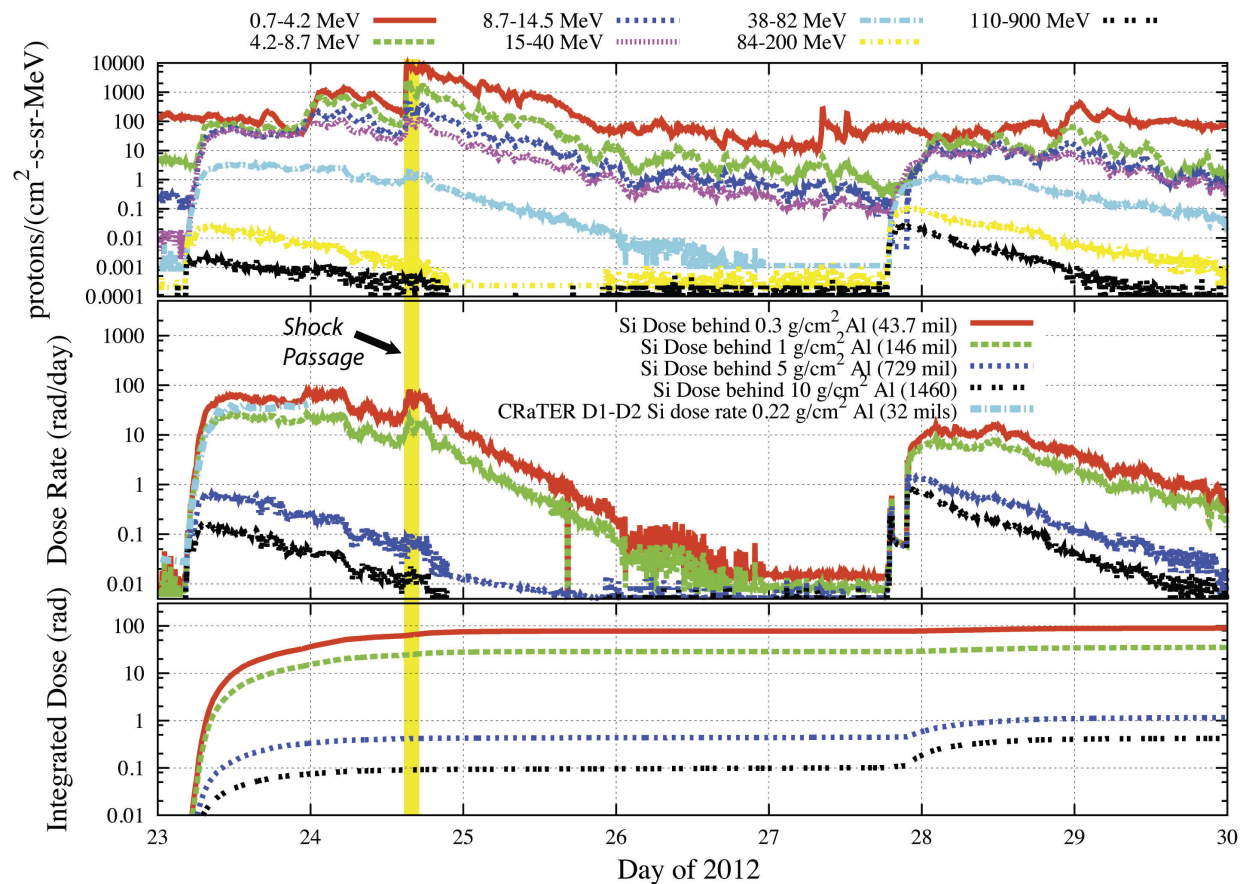
Space Weather Effect on SDO Hardware

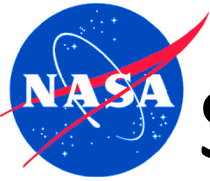




Space Weather Effects on LRO

- Cosmic Ray Telescope for the Effects of Radiation (CRaTER)
- January 23, 2012 & January 27, 2012 (x class flare)





SSMO Space Weather Now and the Future



- Now
 - Space Weather used to explain spacecraft anomalies and degradation
- Future
 - Integrate space weather observations and predictions into telemetry databases
 - Better correlate which events correspond to which spacecraft anomalies
 - In an ideal world, use this correlation to be proactive as *necessary and desirable* with the spacecraft (i.e. turn off hardware, change attitude, etc)
 - Pass back information to design engineers to help future missions